LS - A

LAND SURVEYOR - August 1970

PART A - Wt. 50

CLOSED BOOK

Time Allowed - Four Hours

INSTRUCTIONS TO EXAMINEE:

The first day of this examination consists of two parts of four hours each (morning and afternoon). Each part has a total weighted score of 50 points. The maximum possible score for the first day is 100 points.

Part A consists of 75 problems. All problems are required.

Detach the last sheet from this booklet - this is your Answer Sheet for Part A. Show the appropriate answer in the space provided on the Answer Sheet. For multiple choice problems, enter the appropriate identifying letter in the space provided. For completion-type problems, enter the word(s), or the numerical answer, as appropriate. Your score for Part A of this examination will be based only on the answers shown on your Answer Sheet. You may use any available space in this booklet for computations. When you have completed Part A, return only the Answer Sheet to the proctor. Be sure that your identification number is shown.

No texts, notes, or any other reference materials are permitted in this part of the examination. Calculators or computers of any type are prohibited in this part of the examination. Slide rules are permitted. No work will be accepted after you have turned in your paper to the proctor, or after the close of this examination period.

You may keep the examination questions.

SHOW YOUR ANSWERS ON THE ANSWER SHEET

INSTRUCTIONS: Enter the letter in the space provided on the Answer Sheet which identifies your choice of the alternatives shown. Enter the word, or words, if a completion question is asked.

1. Which of the following is not used to determine the area of a triangle?

   A $A = \frac{1}{2} a\ b$

   B $A = \frac{1}{2} ab \sin C$

   C $A = \sqrt{s\ (s-a)\ (s-b)\ (s-c)}$

   D $A = \frac{a\ b}{2} \times h$

2. A one-sixteenth corner of a section is a corner to what size tract of land?

   A 20 acres

   B 16 acres

   C 40 acres

   D 80 acres

   E 160 acres

3. $\frac{a + b}{a - b} =$

   A $2 ab \cos C$

   B $\frac{\tan \frac{1}{2} (A+B)}{\tan \frac{1}{2} (A-B)}$

   C $a^2 + b^2 - 2 ab \cos C$

   D $\cos \frac{1}{2} ab$

   E $\frac{\tan A}{\tan (90° - A)}$

4. A linear measurement of one meter equals

   A 3.280839 feet

   B 39 inches exactly

   C 39.40+ inches

   D 1.287 yards

   E 600 centimeters

5. A one-sixty-fourth corner of a section relates to

   A sixty-four corners per mile

   B sixty-four chains north of the section corner

   C the fact that the section is subdivided into 10 acre tracts

   D is one quarter way between the quarter corner and the quarter - quarter corner

   E sixteen corners per mile

6. From the southwest corner of a section going north, what is the distance to the first sixteenth corner?

   A 10 chains

   B 16 chains

   C 40 chains

   D 20 chains

   E 30 chains

7. The square root of a number may be easily found by logarithms. Which of the following steps would be performed:

   A multiply the logarithm of the number by two

   B divide the logarithm of the number by two

   C add to the logarithm of the number the logarithm of two

   D add to the logarithm of the number the logarithm of 1/2

   E subtract from the logarithm of the number the logarithm of 1/2

8. A U.S. Geological Survey map drawn at the scale of 1:62,500 is the same as:

   A 1 inch equals ½ mile (exactly)

   B 1 inch equals ½ mile (approximately)

   C 1 inch equals 1 mile (exactly)

   D 1 inch equals 1 mile (approximately)

   E 1 inch equals 200 meters (approximately)

9. The sudden removal of land from the estate of one owner to that of another by the sudden change in the course of a river is known as:

   A accretion

   B avulsion

   C reliction

   D erosion

   E littoral

10. Reproduced herewith is a portion of a table of logarithms of numbers:

N	0	1	2	3	4	5	6	7	8	9
545	73 6397	6476	6556	6635	6715	6795	6874	6954	7034	7113
6	7193	7272	7352	7431	7511	7590	7670	7749	8622	7908
7	7987	8067	8146	8225	8305	8384	8463	8543	9414	8701

The antilog of 2.737465 is:

   A 55.4634

   B 0.54634

   C 5.4634

   D 54634.0

   E 546.34

11. The North American Datum of 1927

A is the currently acceptable datum upon which the U.S.C. & G.S. level circuits are based

B places all U.S.C. & G.S. triangulated distances at sea level elevation

C is based on the Clark Spheroid of 1886

D has no present day significance

12. In terms of the cosecant of A, the sine of A =

A $\frac{\sqrt{\csc^2 A - 1}}{\csc A}$

B $\frac{1}{\csc A}$

C $\frac{1}{\sqrt{\csc^2 A - 1}}$

D $\sqrt{\csc^2 A - 1}$

E $\frac{\csc A}{\sqrt{\csc^2 A - 1}}$

13. The log sin 2x is equal to which of the following?

A log 2x + log sin x

B 2 log sin x

C log 2 + log sin x

D log 2 + log sin x + log cos x

E log 2x + log sin x + log cos x

14. To collimate a survey instrument such as a transit

A means to make the A and B verniers read zero

B means to adjust the level vials

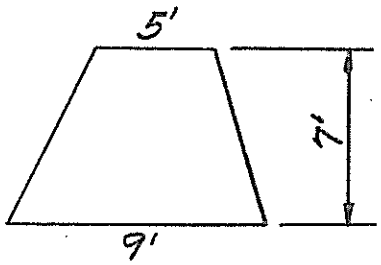
C means to make the mechanical axis of the telescope coincident with the optical axis

D means to compensate for eccentricity in the horizontal plate

E means to adjust the vertical circle

15. Determine the area of the Trapezoid shown in square feet.

A 45
B 35
C 63
D 49



16. Which of the following contains the correct relationship of values?

A 360 degrees = 100 grads
B 1 grad = 1/100 radians
C 2000 mils = 200 grads
D 1 grad = 9/10 degree
E 1 degree = 9/10 grad

17. A property line which bears S60°00'W can also be identified as an azimuth from the North of

A 030°
B 060°
C 120°
D 240°
E 300°

18. If the function $y = 2 \cos \frac{x}{2}$ (where x is in radians) is plotted on a graph it will pass through the point where coordinates are

A (π, -2)
B (2π, -2)
C (2π, +2)
D (π, +2)
E (π, +1)

19. The numerical value of $\cos \frac{\pi}{3}$ radians is

A 1
B 10
C 15
D 1/2
E 2

20. Except where the grant under which the land is held indicates a different intent, the owner of lands adjacent to a nontidal river owns to the:

A low water mark
B thread of river
C meander line
D high water mark

21. The tide on the California Coast generally consists of two high tides and two low tides during a tidal day. This type of tide is termed:

A semidiurnal tide
B diurnal tide
C neap tide
D retrograde tide
E spring tide

22. Tide tables issued by the U.S. Coast and Geodetic Survey for use on the California Coast are based on the datum of:

A Mean Sea Level (MSL)
B Mean Tide Level (MTL)
C Mean Low Water (MLW)
D Mean Lower Low Water (MLLW)
E Mean Low Water Springs (MLWS)

23. A two pole chain would be the equivalent of:

A 30 feet

B 1/4 Gunter's chain

C 1/2 Gunter's chain

D 66 links

E 66 inches

24. The position of a star can be identified on the celestial sphere by measurements taken from the celestial equator and the vernal equinox. The measurements are called

A latitude and longitude

B declination and right ascension

C altitude and observers horizon

D zenith distance and hour angle

E vertical circle and polar distance

25. In a regular four-sided figure (90° angles), which of the following contains exactly one acre of land in area?

A 206.7 feet by 206.7 feet

B 2 chains by 5 chains

C 200 links by 495 links

D 209.7 feet by 209.7 feet

26. The most probable value of a series of like observations when reduced to a single quantity is the

A difference between the residuals

B mean of the residuals

C mean of the deviations from the standard error

D root mean square of the readings

E average of the readings

27. The slight wiggle of a plumb bob point is best characterized by which of the following:

A mistake

B systematic error

C blunder

D accidental error

E standard error

28. The balancing of the horizontal lengths of foresights and backsights when running differential levels is done to neutralize the potential error due to

A parallax

B the line of sight not parallel to the axis of the bubble tube

C the level rod being nearly plumb

D the bubble is not exactly centered at the line the rod reading is made on

E the horizontal cross hair is not in a plane perpendicular to the vertical axis

29. In trigonometric leveling when reciprocal vertical angles are not measured a correction must be made for

A temperature and pressure

B pressure and refraction

C altitude and curvature

D curvature and temperature

E refraction and curvature

30. Normal tension as applied to chaining is

A the tension required to make a 100 foot tape equal exactly 100 feet fully supported

B the average tension pulled for tapes of a specific dimension

C the tension assigned to a tape to offset the effects of sag

D the tension applied in chaining slopes of more than 15°

E the tension that is applied at 68° F

31. The fundamental rule in retracing a survey is:

A faithfully follow all deed dimensions since it shows the original intent

B follow the footsteps of the original surveyor

C accept any monuments found in the retracement

D accept only the monuments shown on a recorded map

E obtain testimony from someone who has knowledge of the original survey

32. Which of the following is <u>not</u> an essential quality and characteristic of an easement?

A It is an interest in land, being one of the elements of real property, and generally must be transferred and used subject to the rules governing real property.

B A charge imposed upon specific property by which it is made security for the performance of an act, usually the payment of money.

C It is an interest in the land of another person; an owner of land cannot, as a rule, have an easement in his own land.

D It is considered as a non-possessory interest, and is capable of creation by a conveyance.

33. The corner common to Sections 7, 12, 13 and 18 has been declared lost. All other corners of the four sections have been located. Which of the following procedures is correct to re-establish the lost corner?

A Set halfway between the North one-quarter corner of Section 13 and the North one-quarter corner of Section 18.

B Set by single proportion on line between the one-quarter corner common to Sections 7 and 12, and the one-quarter corner common to Sections 13 and 18.

C Set at the record distance from the North one-quarter corner of Section 13

D Set by double proportion using the one-quarter corners common to Sections 7 and 18, 12 and 13, 7 and 12, and 13 and 18.

34. The California Coordinate System identifies a mapping angle which, for this place, bears a relationship to the central meridian that is

A equal to the longitude difference

B more than the longitude difference

C less than the longitude difference

D not allied with the longitude difference

35. A rectangular piece of land is 11 chains 4 links in length by 14 chains 35 links in width. Its area is

A 1.64 acres

B 16.36 acres

C 16 square rods

D 12.20 acres

36. One of the following factors need not be considered when conducting surveys based on the California Coordinate System.

A grid factor

B proper grid zone

C Latitude

D height above sea level

37. Assuming that the C-factor of a plotting instrument is 700, compute the flying height of the aircraft above the average elevation required for mapping on a 5 foot contour interval

A 4200 ft.

B 3500 ft.

C 3000 ft.

D 4000 ft.

38. If facts in a deed are in conflict, it becomes necessary to decide which fact was intended and which was informational before a proper location can be made. A deed written S 25° 15' W 565.75 feet to the Southwest corner of said Section 15 presents a problem of conflict. What was intended?

A to go S 25° 15' W 565.75 feet to the corner

B to go S 25° 15' W some distance to the corner

C to go to the corner whatever Bearing and Distance it may be

D to go 565.75 feet to the corner whatever the Bearing may be

39. The manager of a local radio station has asked you to determine the longitude and latitude of the warning light atop his transmitting tower to the nearest second of longitude and latitude. Consistent with this accuracy requirement you would locate the center of the light to the nearest:

A 50 feet

B 5 feet

C 500 feet

D 100 feet

E 1 meter

40. Observations for azimuth are frequently taken on the star Polaris because of its proximity to the north celestial pole. The polar distance of Polaris is approximately:

A 5°

B 1°

C 10'

D 1'

E 10"

41. According to the current system for the survey of the Public Lands, the line common to sections 35 and 36 is run:

A due north by solar observation

B parallel to the west boundary of the township

C at right angles to the standard parallel

D parallel to the principal meridian

E parallel to the east boundary of the township

42. A European surveying instrument comes packed in a case that indicates the instrument has been calibrated at a standard temperature of 20° Centigrade. What temperature in degrees Fahrenheit does this correspond to?

A 32° F

B 56° F

C 68° F

D 72.4° F

E 90° F

43. The N ½ of the NE ¼ of the SW ¼ of the SE ¼ of a section would nominally contain _____ acres

A 2½

B 5

C 10

D 20

E 40

44. Which of the following conditions will show the greatest accuracy in volume calculations for the prismoidal method when compared to the average end area method?

A the two end areas are shaped differently but are equal in area

B one end area is a straight line thus forming a volume that is shaped like a wedge

C the two end areas are approximately equal

D the end area at one end of the volume is a point thus forming a volume shaped like a pyramid

E the two end areas are both identified as five level sections

45. When staking a circular curve for a highway location the degree of curve is

A equal to the deflection angle between adjacent tangents

B an angle subtended by an arc 100 feet long

C equal to the central angle divided by the length of the curve in stations

D equal to the central angle divided by 57.3 degrees

E an angle subtended by a chord 100 feet long

46. Because of the development of highly accurate electronic distance-measuring devices, a triangulation system can be completely observed, computed, and adjusted by measuring the lengths of the sides in the network. This procedure is known as _____.

47. Solve the following equation for X

$$X + Y = 17$$
$$4X + 2Y = 42$$

A 4

B 5

C 8

D 10

48. If a vertical line at any point on the earth's surface is extended, it intersects the upper portion of the celestial sphere at the _____.

A nadir

B meridian plane

C Zenith

D Horizon

49. If the matters appearing on the record of survey cannot be agreed upon by the licensed land surveyor or the registered civil engineer and the county surveyor within _____ calendar days from the date of submission, an explanation of the differences shall be noted on the map and it shall be presented by the county surveyor to the county recorder for filing.

A 90

B 38

C 60

D 28

50. Relief displacement in a vertical photograph is a function of

A focal length and flying height

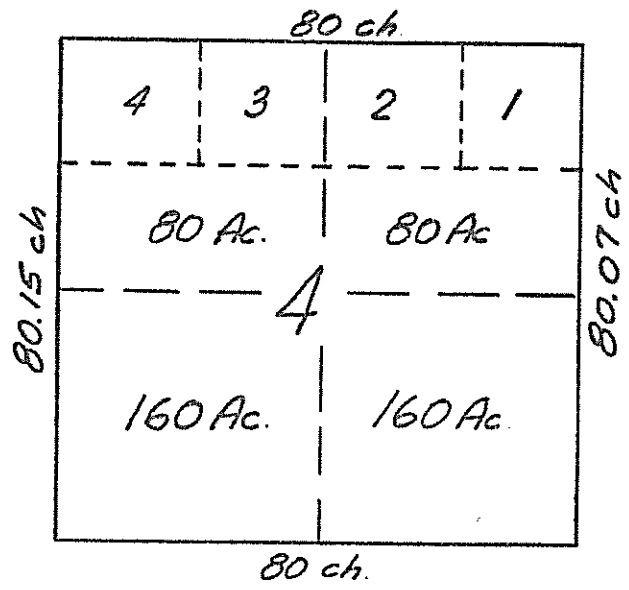
B radial distance on photo, elevation of point, focal length, and flying height

C radial distance of point on photo, elevation, and flying height

D radial distance of point of photo, focal length, and flying height

51. Based on the information given on the plat below of Section 4, the area of Lot 2 is _____.

A 40.22
B 40.24
C 40.16
D 40.20



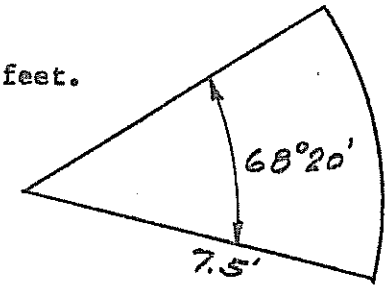
52. An alidade is used (mark most complete statement)

A in resection problems
B to determine bearings
C extensively in topographic surveying
D to spot contour intervals
E to compute areas

53. What is the geodetic azimuth (measured from South) of a line between two points based on the California Coordinate System if the grid bearing of the line is N 22° 15' 20" W? θ = +0° 12' 20" Neglect second term.

A 157° 32' 20"
B 157° 57' 00"
C 337° 32' 20"
D 337° 57' 00"

54. Determine the area of the sector shown in square feet.



A 29.7

B 38.5

C 33.6

D 36.3

55. A plane table may be oriented in the field by resection from known points. It is common to produce a triangle of error which will have the strongest resolution when the point sought is

A on the great circle

B near the great circle, and near a known station

C inside the great circle and near the center of gravity of the great triangle

D outside the great circle

56. The closing corners found along a township line

A may be relied on as the true location of the section corners

B must be used exclusively to determine the true location of the interior section corners

C are generally established by double proportionate measurement

D control the direction of the North-South section line in an East-West position

57. The terms: Initial Point, Base Line, Principal Meridian, Standard Parallels, and Guide Meridians are associated with:

A California Division of Highways Surveys

B Coast and Geodetic Surveys

C Corp of Engineer Surveys

D Public Land Surveys

58. Meander lines were run in surveying fractional portions of the public lands bordering on navigable rivers

A as the boundary of the tract

B as a means of ascertaining the quantity of land

C to see if their traverses would close

D as a means of locating the rivers so they can be shown on the plat

59. Your survey shows considerable discrepancy with the government plat and field notes, both in direction and distance between two original found monuments. The monuments were verified by you from witness trees called for in the notes. You must:

A use corners found in adjacent sections to relocate the erroneous corners

B prove which of the monuments is in error, correct the position of the erroneous monument and file a record of survey

C accept the monuments as found to be true and correct, prorate the error throughout this portion of the line, and file a record of survey

D request the Bureau of Land Management to rectify the error

60. The interval of time between two successive upper transits of the vernal equinox over the same meridian is called a _____.

A apparent solar day

B solar year

C sidereal day

D mean solar day

61. The observed vertical angle of a star is 15° 10' 20". The observation corrected for the error introduced by refraction would be nearest:

A 11° 40' 20"

B 15° 06' 50"

C 15° 13' 50"

D 18° 40' 20"

62. A formula employed for the determination of the middle ordinate of a circular curve is:

A 2R sin 1/2A = M

B R vers 1/2A = M

C 2R cos 1/2A = M

D R tan A = M

Assume -

A = central angle

R = radius

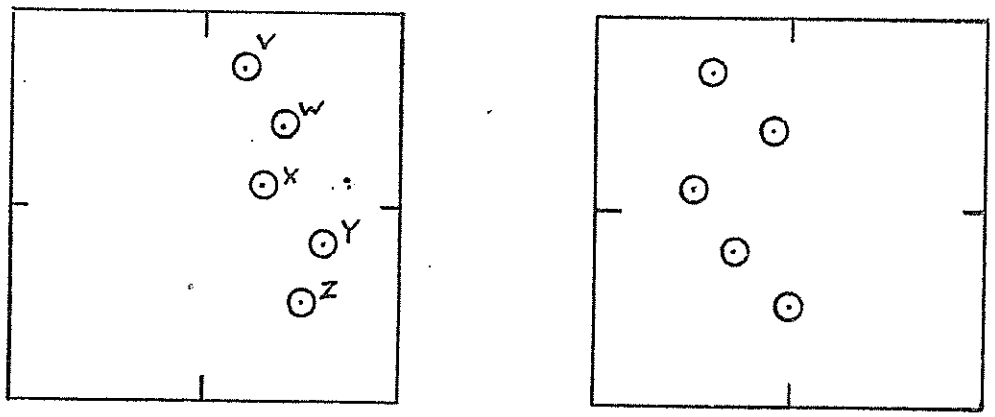
M = middle ordinate

63. A conformal map projection of the so-called cylindrical type is referred to as a _____ projection.

64. _____ is a mathematical method of determining the most probable values of a series of quantities from a set of observations greater in number than are necessary to determine those quantities.

65. _____ error, is sometimes designated as an irregular error, produced by irregular causes whose effects upon individual observations are governed by no fixed law connecting them with circumstances.

66. In the following stereogram which point is next to the lowest in elevation?



A V

B W

C X

D Y

E Z

67. In 1820, when the declination was 15° East, a surveyor ran a line from A to B and observed a magnetic bearing of N 16° W from A. You have to retrace this line and the declination is now 17½° East. The magnetic bearing you will observe from A is:

A N 16° W

B N 18½ W

C N 13½ W

D N 33½ W

68. On an aerial photograph the vanishing point of the images of vertical objects is the same as

A principal point

B nodal point

C focal point

D optical center

E nadir point

69. The PZS spherical triangle may be used as the basis for determining azimuth of the sun, and the three functions are

A declination, altitude, and zenith distances

B zenith distance, colatitude, coaltitude

C polar distance, colatitude, codeclination

D polar distance, zenith distance, colatitude

E zenith distance, right ascension, and colatitude

70. Cross sections have been taken in the field at two stations which are 100 feet apart. One of the sections is in fill, and the other section is at grade and is actually a straight line with essentially zero area. To find the volume of earthwork between these stations the most accurate method is to use the

A average end area method

B prismoidal method

C prismoidal correction divided by two

D DMD method

E grade and the ground rod readings

71. A deed that merely conveys whatever interest a grantor may have and contains no guarantee that a grantor owns any interest in the subject matter of his deed is called a

A grant deed

B warranty deed

C easement deed

D quitclaim deed

72. The voluntary giving of land for some public use made by the owner and accepted for such use by or on behalf of the public is called _____.

73. Under normal and accepted USC & GS standards of accuracy for Class I Second Order Triangulation the average triangle closure is not to exceed

A 5 seconds

B 2.5 seconds

C 1.5 seconds

D 10 seconds

74. Under normal and accepted standards of accuracy for Class II USC & GS Second Order Triangulation, the maximum limit of R_1 and R_2 values relative to strength of figures are

	R_1	R_2
A	40,	120
B	30,	110
C	50,	100
D	25,	80

75. An assembly of photographs trimmed to show the center portion of each photograph is called a

A contact print

B oblique photograph

C uncontrolled mosaic

D stereoscopic model

E controlled mosaic

ID. NO. _____

LABOR SURVEY - 1976

MINER STUDY - PART A

LIST ANY JOB TASKS AS DESCRIBED TO YOU DURING THE INTERVIEW

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75. _____

REVIEW THIS ARTICLE BEFORE GOING TO THE DEPOSE WITH YOU HAVE COMPLETED PART A

LS

LAND SURVEYOR - 1970

B

PART B - Wt. 50

This booklet contains the problems for Part B of this examination.

The general instructions are shown on the cover page of the workbook which you have already received. Please read them.

All of the work which will be scored must be included in your workbook. No work will be accepted or considered that is not in the hands of the proctor at the close of the examination period.

No books, notes, or reference material may be used in this part of the examination. Slide rules and minor drafting aids, such as triangles, scales, french curves, and compasses are permitted.

You may keep this set of examination questions.

Work any combination of problems for a total of 50 points.

NOTE: All Problems in Part B are Optional.

Problem B1 - Wt. 2

A camera with a focal length of 6 inches was used to take a vertical aerial photograph from a flying height of 3000 ft. above sea level. The terrain photographed has an average elevation of 300 ft. above sea level.

a Determine the scale of the aerial photograph as a representative fraction

b Determine the scale of the aerial photograph as an engineer's scale. (i.e., 1 inch = ____ ft.).

Problem B2 - Wt. 4

Define in your own words each of the following terms:

a mean sea level

b neap tides

c spring tides

d lower low water

e tidal day

f lower high water

Problem B3 - Wt. 5

The following measurements were read in the field, and each is the accurately measured length of the same base line.

747.454	747.429	747.410
747.474	747.436	747.452
747.461	747.424	747.458
747.448	747.456	747.472

a What is the most probable length of the base line?

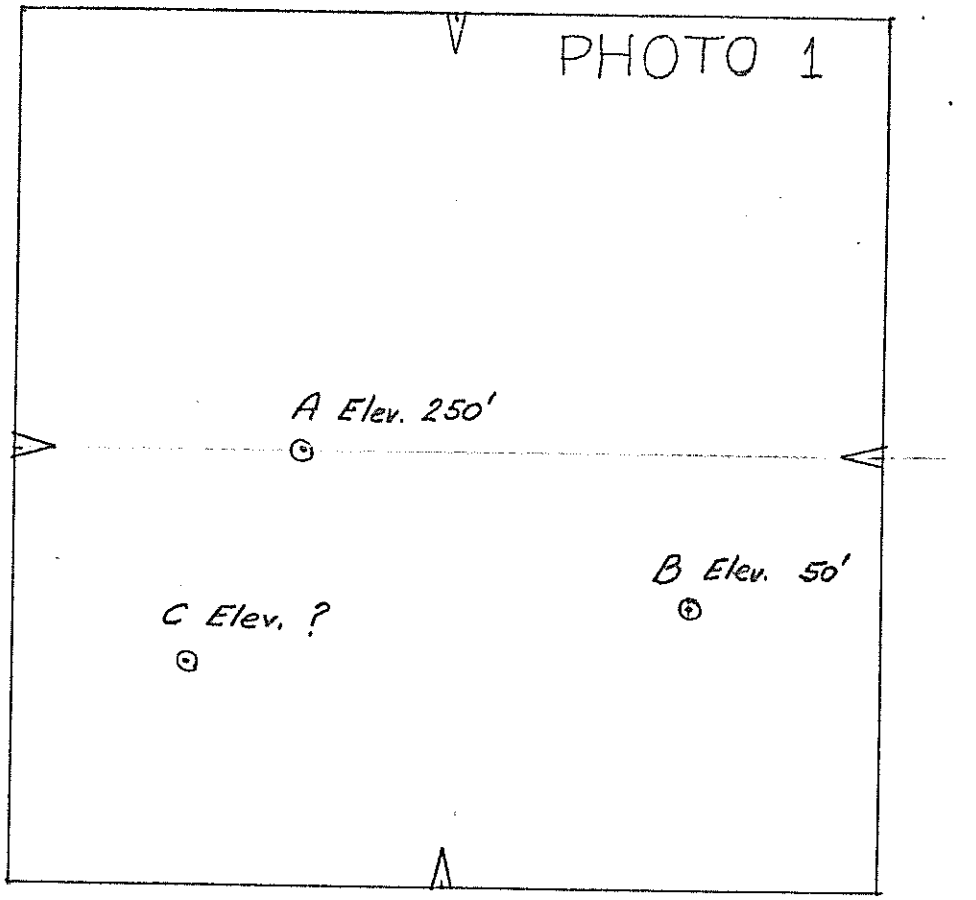
b What is the probable error of the first reading listed?

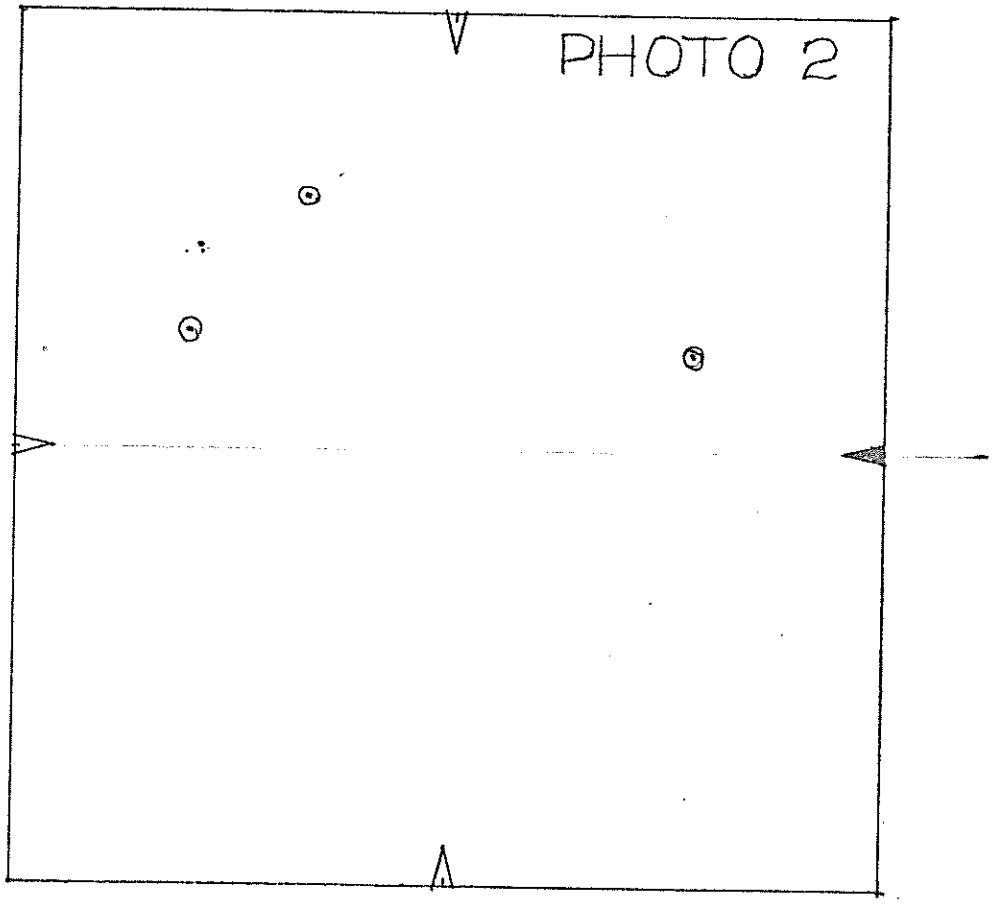
c What is the standard error of the last reading listed?

d How would you determine the probable error of the mean?

Problem #4 - Pt. 4

The two overlapping aerial photographs have a principal distance of 3 inches. The distance A-B has a sea level length of 2000 feet. Compute the elevation of Point C.





Problem B5 - Wt. 4

You are engaged to resurvey a portion of Township 5 North, Range 3 East, _____ Meridian, California. An old map you have found indicates the north line of this township to be the First Standard Parallel North. Is this correct? Explain.

Problem B6 - Wt. 4

Define in your own words the following terms:

a geoid

b Clarke's spheroid of 1866

Compare and contrast the geoid; Clarke's spheroid of 1866; and the actual topographical configuration of the earth.

Problem B7 - Wt. 5

A polar planimeter which reads in square inches is used on maps having the following scales:

a 1 inch to 60 ft.

b 1 inch to 83 ft. (Odd-size photo reduction).

c 1 inch to 4 chains

Give in each case the multiplier to be applied to the square inch reading to obtain the area in acres.

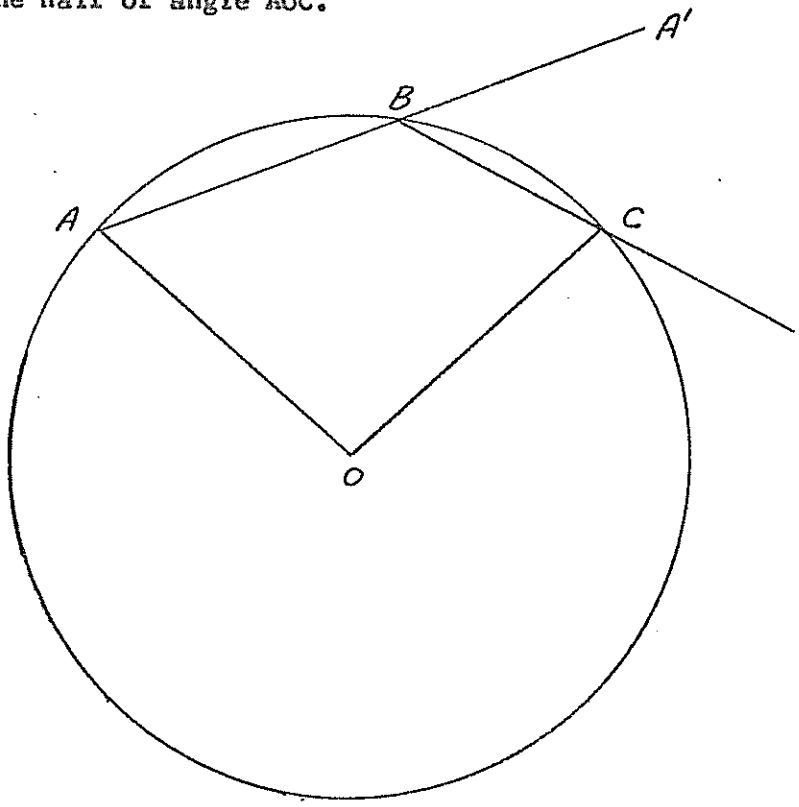
d The same planimeter is used with the anchor inside the figure, with a reading of 57.21 on a map having a scale of 1 inch to 40 feet. The pole constant is 218.44 square inches. What is the area of the figure in square feet?

e You have a map on which the scale is indicated as 5 chains to the inch. However, your copy is a photo-reduction to 58 percent of the original size. How many inches would you measure to lay out 723 feet?

Note: Slide rule accuracy is not adequate for this problem.

Problem B8 - Wt. 4

In laying out a curve from a point on the curve it is well known that the deflection angle to be turned from one point on the curve to another point on the curve is equal to one half of the central angle. In the figure below, if the transit is set at B and A is sighted, prove geometrically that the deflection angle A'BC to be turned is equal to one half of angle AOC.



Problem B9 - Wt. 3

Record monuments, natural physical monuments, and artificial monuments are classifications for monuments encountered in surveying practice. List these in their normal order of importance and give examples of each type.

Problem B10 - Wt. 3

Normally distance is superior to direction, and direction superior to area. Briefly discuss this principle. Do you agree with it from a practical standpoint?

Problem B11 - Wt. 3

The number 1718.8734 is a constant used for figuring deflection angles for curves. The constant is the deflection angle in minutes for a curve with a radius of one unit and an arc length of one unit. Explain the derivation of the constant and show how it is used to compute deflection angles for a curve.

Problem B12 - Wt. 3

Briefly distinguish between a record of survey map, a tentative map, a parcel map, and a final map.

Problem B13 - Wt. 3

The coordinate for monument A is 5000 N, 3000 E; the coordinate for monument B is 6000 N, 4000 E. A line is run from monument A and a hub is set by field calculation at a predetermined coordinate position 550 N, 3500. The traverse is completed by checking into monument B. The computed field traverse coordinate for monument B is 6000.25 N, 4000.25 E. Assuming the traverse was run in essentially straight lines and the given coordinates for monuments A and B are to be held, how much and in what direction is the set hub to be adjusted to be put in the given coordinate position? (The adjustment is to be proportional to the total traverse run.)

Problem B14 - Wt. 4

a An angle of 89°37' is to be turned to set a point at a distance of 170 ft. from the instrument. Due to obstructions the full angle cannot be turned, so a temporary point is set at the same distance at an angle of 89°21'. How far will the temporary point be from the true point?

b The bearing of a line AB is given as N61°32'E. What angle would you turn from it to obtain a bearing of S31°43'E for line AC?

c You have a description describing a line EF with bearing N0°32'E and line EG taking off therefrom on a bearing of N16°11'E. However, you are using a different basis of bearings, on which line EF is N0°15'W. What is the bearing of line EG on your basis?

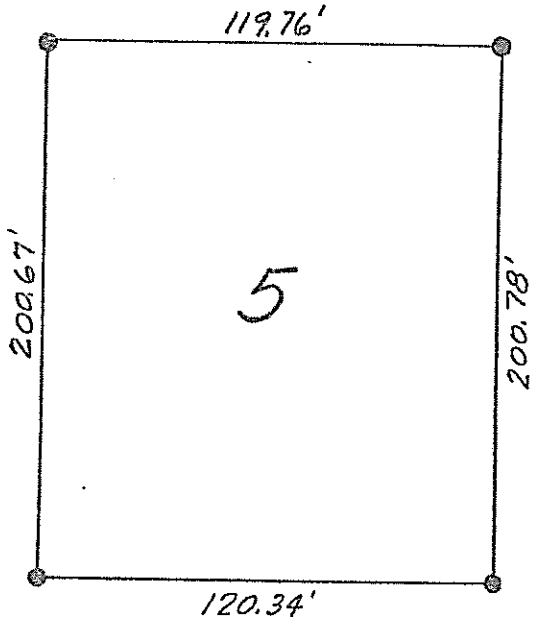
Problem B15 - Wt. 2

Easements are divided into two classes, namely, easements appurtenant, and easements in gross. Describe each of these and give an example.

Problem B16 - Wt. 4

a What are the dimensions of the parcel conveyed on June 2, 1945, to Black as "West half of Lot 5"?

b Where would you place the West line of the parcel conveyed on September 6, 1946, to Moore as "the East 60 feet of Lot 5"?



● Denotes found original corner

The record dimensions of Lot 5 are 120' x 200'

The lengths that you measure are as shown on the sketch

Lot 5 conveyed to King on January 5, 1940

Problem B17 - Wt. 4

What are the essential elements of adverse possession? Describe at least 4.

Problem B18 - Wt. 3

There are three general methods for establishing a true parallel of latitude. Describe each method.

Problem B19 - Wt. 3

Describe the following terms and show them on a sketch: Area of Confusion, Gore, Point of Confusion.

Problem B20 - Wt. 3

Describe the field procedure you should use for making a solar observation.

Problem B21 - Wt. 4

A line D-E is defined by the coordinates of each end

D is at 1000.00 N, 1000.00 E
E is at 1300.00 N, 1400.00 E

a What is the departure of the line?

b What is the latitude of the line?

c What is the length of the line?

d What is the bearing of the line?

Problem B22 - Wt. 3

The average elevation of a Baseline is 8000 feet. The horizontal distance of the base is 211,200.00 feet. The radius of the earth is given as 20,906,000 feet.

What is the length reduced to Sea Level?

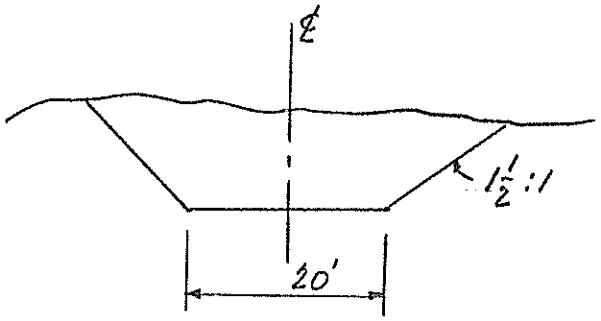
(Note: Slide rule accuracy is not adequate for this problem)

Problem B23 - Wt. 4

Field notes taken from a survey show the following elevations at the points indicated

				℄		
Sta. 9 + 78	El.	116.8 20.2	102.3 6.0	102.7 0.0	103.0 4.0	107.0 20.5
Sta. 9 + 10	El.	103.2 14.8	106.8 9.2	105.6 0.0	103.0 9.0	104.8 17.2

If a level grade is established at Elevation 100.00 with a width of 20 feet and side slopes of 1½:1 what is the volume contained between the stations?



Problem B24 - Wt. 2

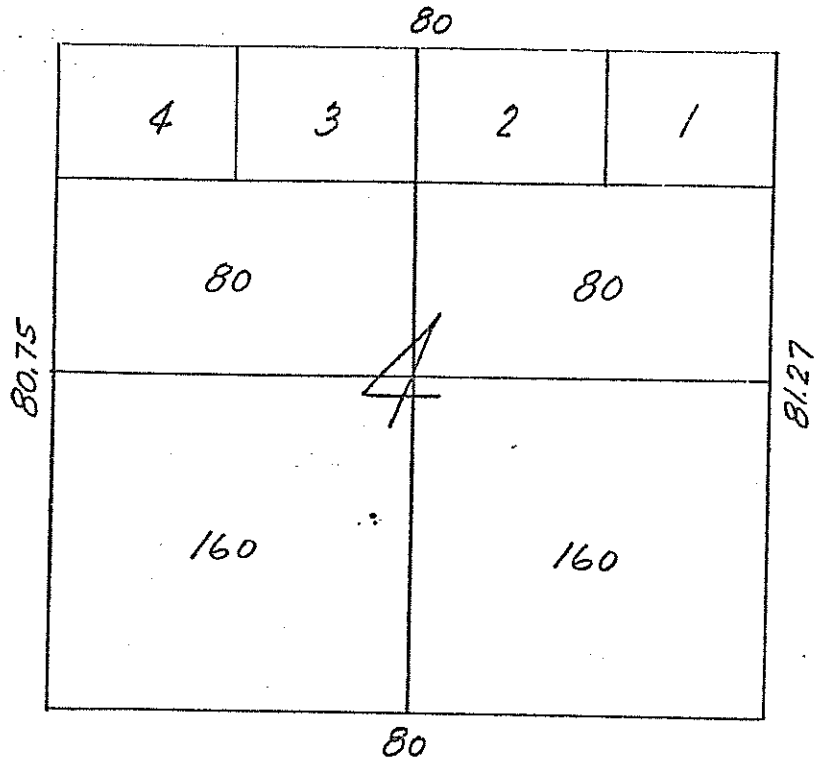
Describe two situations where after making a survey you are required to file a Record of Survey.

Problem B25 - Wt. 2

Describe two situations where the Land Surveyors' Act requires monumentation.

Problem B26 - Wt. 4

Based on the information on the plat of Section 4 shown below, what is the area of Lot 3?



END OF PART B

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LAND SURVEYOR - 1970

C

Part C - Weight 50

This booklet contains the problems for Part C of this examination.

The general instructions are shown on the cover page of your workbook. Please read them.

When you have completed your work for Part C arrange the problems in your workbook in proper sequence, and check your workbook to see that it is complete. No work will be accepted or scored that is not turned in to the proctor at the close of the examination period.

You are to work the problems that are given in the examination booklet. You may make appropriate assumptions where they are asked for, or if a problem is incomplete, or is obviously in error. If an assumption is necessary, you should provide sufficient explanation so that the examiner can judge the reasons therefor. Assumptions must generally follow the logic and the requirements of the problem.

At the end of each problem, list any reference book, diagram, or tables which you have used. Give book title, edition, and page number.

Mechanically-operated calculators may be used in this part of the examination. Calculators permitted include only those that are operated by a hand crank or battery power. Plug-in type electrically-powered calculators and computers are excluded. Proctors are instructed to prohibit the use of all electrically-powered machines other than those that are self-contained.

You may keep this set of examination questions.

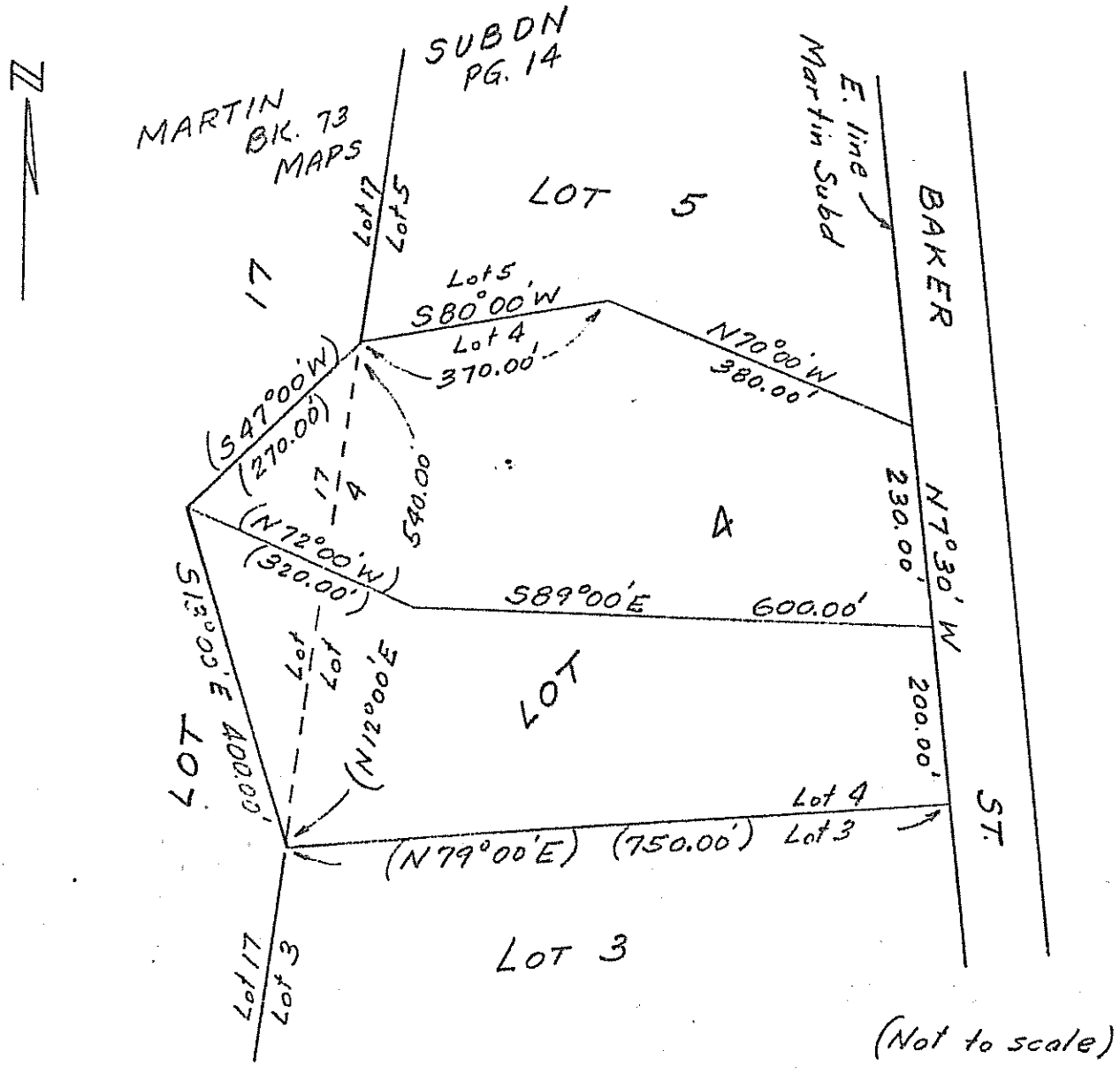
You are required to work Problems C1, C2, and C3, plus a choice of one.

Problem C1 - Wt. 12.5

The plat shown below identifies an ownership in Lots 4 and 17. Lot 4 does not close mathematically. It is suspected that the values shown in parenthesis are in error. In the field, the suspected lines are impassable, and it is not intended that they be field checked.

REQUIRED:

Prepare a legal description of the Southerly parcel indicated on the plat that will convey good title at this time. No computations are required for this problem.



Problem C2 - Wt. 12.5

The following field notes are taken from a transit - stadia survey which was made to determine the volume of silver ore that stands in a pile shaped somewhat like a cone:

⊼ at Sta. "B" H.I = 5.2 ft.

Elev. Sta. "B" = 95.8 ft.

Sta.	Stad. Dist.	Hor. Dist.	Az. Ang.	Vert. Ang.	Rod Rdg.	Diff. Elev.	Elev.	Remarks
	50	50	90°	0° on	1.0	+4.2	100.0	Bottom of Slope
	36		81°	0° on	1.0			"
	36		56°30'	0° on	1.0			"
	50		46°30'	0° on	1.0			"
	64	64	51°30'	+3°46'	5.2	+4.2	100.0	"
	73		60°	+8°06' on	11.2			"
	74		74°	+8°00' on	11.2			"
	62		86°30'	+3°54'	5.2			"
	67		72°	+10°40'	5.2			Peak

Note: Azimuths measured clockwise from Sta. "A".

Stadia Constant = 100

Telescope is of the internal focusing type.

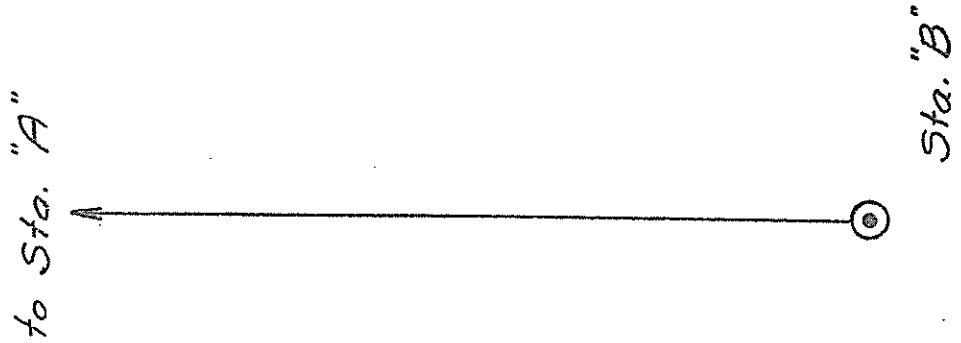
REQUIRED:

Reproduce the notes in your workbook, and complete the reduction of the field notes.

Draw a contour map from the known data. Plot all the known points, and use a scale of 1" = 20 feet with a 2 foot contour interval. Begin with the 100 ft. contour. The following page shows Stations A and B. Reproduce the plotting of points A and B in your workbook, and draw your map on one grid sheet.

Calculate the total volume of ore material which lies above the 100 ft. contour. Give volume in cubic yards.

Problem C2 - Wt. 12.5 (Continued)



Problem C3 - Wt. 12.5

The geodetic latitude and longitude of Station "Bar" are given as follows:

Station: BAR

Geodetic Data:

Latitude 33° 43' 54.664" North

Longitude 118° 19' 55.263" West

Datum: North American 1927

REQUIRED:

Convert the given information to "X" and "Y" coordinates of the California Coordinate System. You may convert to either Zone 6 or Zone 7 coordinates.

(Note: A ten place calculator is not required)

(Hint: cosine θ = 1 - versine θ)

Problem C4 - Wt. 12.5

The plat below shows several lots with incomplete data.

REQUIRED:

a Compute the lengths of the boundaries for Lots 24, 25, and 26 where they are not given.

b Compute the total area of each lot to the nearest 10 square feet.

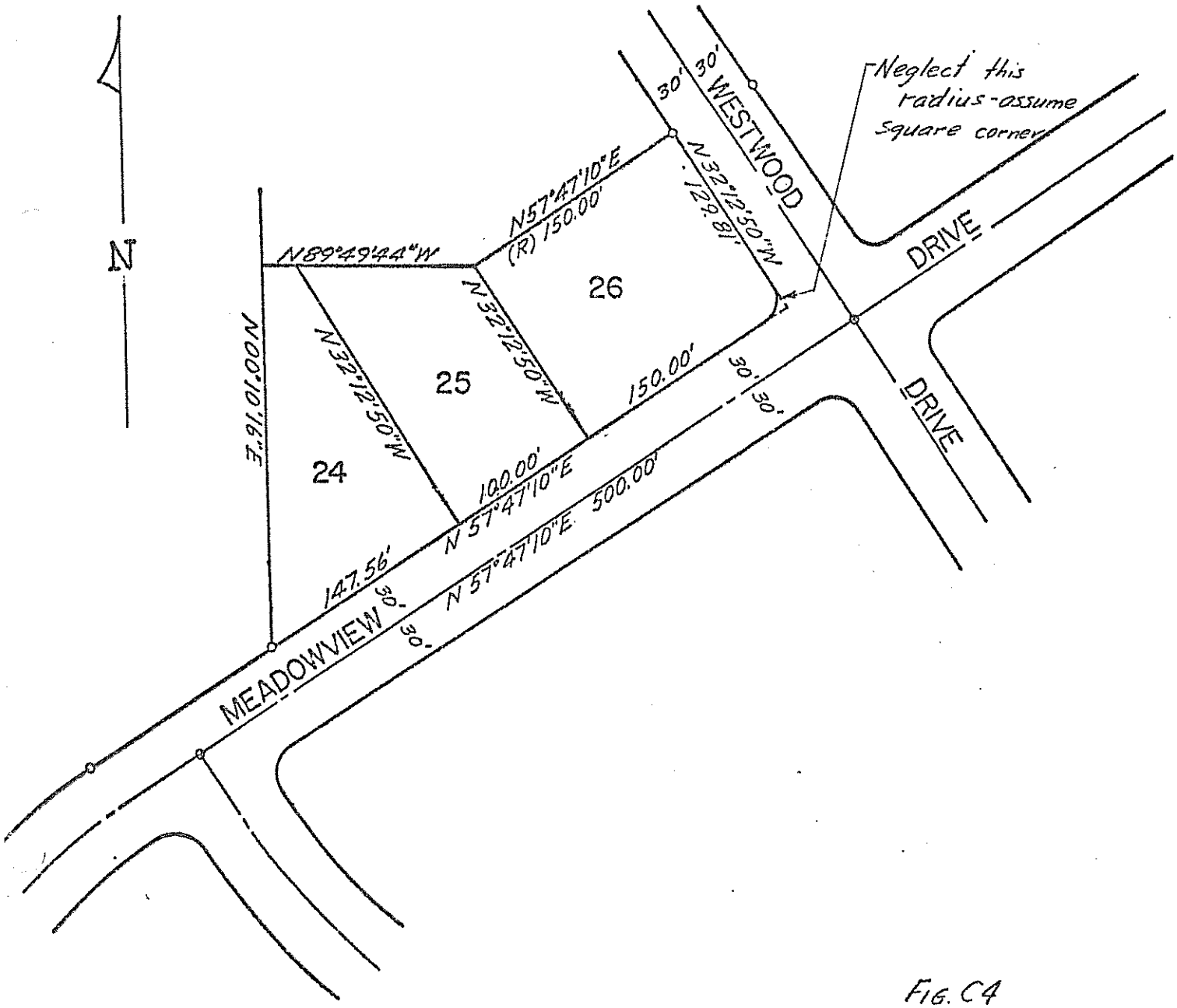


FIG. C4

Problem C5 - Wt. 12.5

A typical problem for a land surveyor is to make a boundary survey for a parcel of land which is located in the suburban part of a large city. The parcel may be described by a metes and bounds description in which may appear calls to adjoiners that may, or may not, have senior rights.

REQUIRED:

You are to describe in proper sequence the office and field procedures that would be required to accomplish a survey of such a parcel beginning with the acceptance of a client's deed, or a current title report, through to such time that you furnish the client with a record map.

Discuss such items as:

1. preliminary research
2. precision of field work
3. monuments to be sought or set
4. resolution of conflicting information
5. related work in the office

Do not include details of how the actual field work is done, and do not include discussion of the details of map preparation.

Problem C6 - Wt. 12.5

A 300 foot long steel tape is frequently used as a measuring device. To assure accurate measurement it is usual to use a 50 - 60 pound pull. It is also possible to use a lesser pull on the tape provided a correction is applied which will assure a reasonably equivalent measurement.

Given data:

Tape used - 300 foot steel

Area - 0.005 sq. in. (cross section)

Standard tension - 10 lbs.

Working tension - 35 lbs.

REQUIRED:

a Prepare a table of corrections which will apply to each 50 foot interval on the tape (0, 50, 100, 150, etc.)

b Prepare a graphical plot of the 50 foot interval data so that the correction for any distance may be readily obtained in the field. (Plot correction vertical and length horizontal)

c Prepare one example to demonstrate how the chart can be used.

d Discuss the advantages vs. the disadvantages of the method; the sources of error, and how this method can be improved upon.

LS

LAND SURVEYOR - 1970

D

Part D - Weight 50

This booklet contains the problems for Part D of this examination.

The general instructions are shown on the cover page of your workbook. Please read them.

When you have completed your work for Part D arrange the problems in your workbook in proper sequence, and check your workbook to see that it is complete. No work will be accepted or scored that is not turned in to the proctor at the close of the examination period.

You are to work the problems that are given in the examination booklet. You may make appropriate assumptions where they are asked for, or if a problem is incomplete, or is obviously in error. If an assumption is necessary, you should provide sufficient explanation so that the examiner can judge the reasons therefor. Assumptions must generally follow the logic and the requirements of the problem.

At the end of each problem, list any reference book, diagram, or tables which you have used. Give book title, edition, and page number.

Mechanically-operated calculators may be used in this part of the examination. Calculators permitted include only those that are operated by a hand crank. Electrically-powered calculators and computers are prohibited. Proctors are instructed to prohibit the use of electrically-powered machines.

You may keep this set of examination questions.

Choose any 50 points.

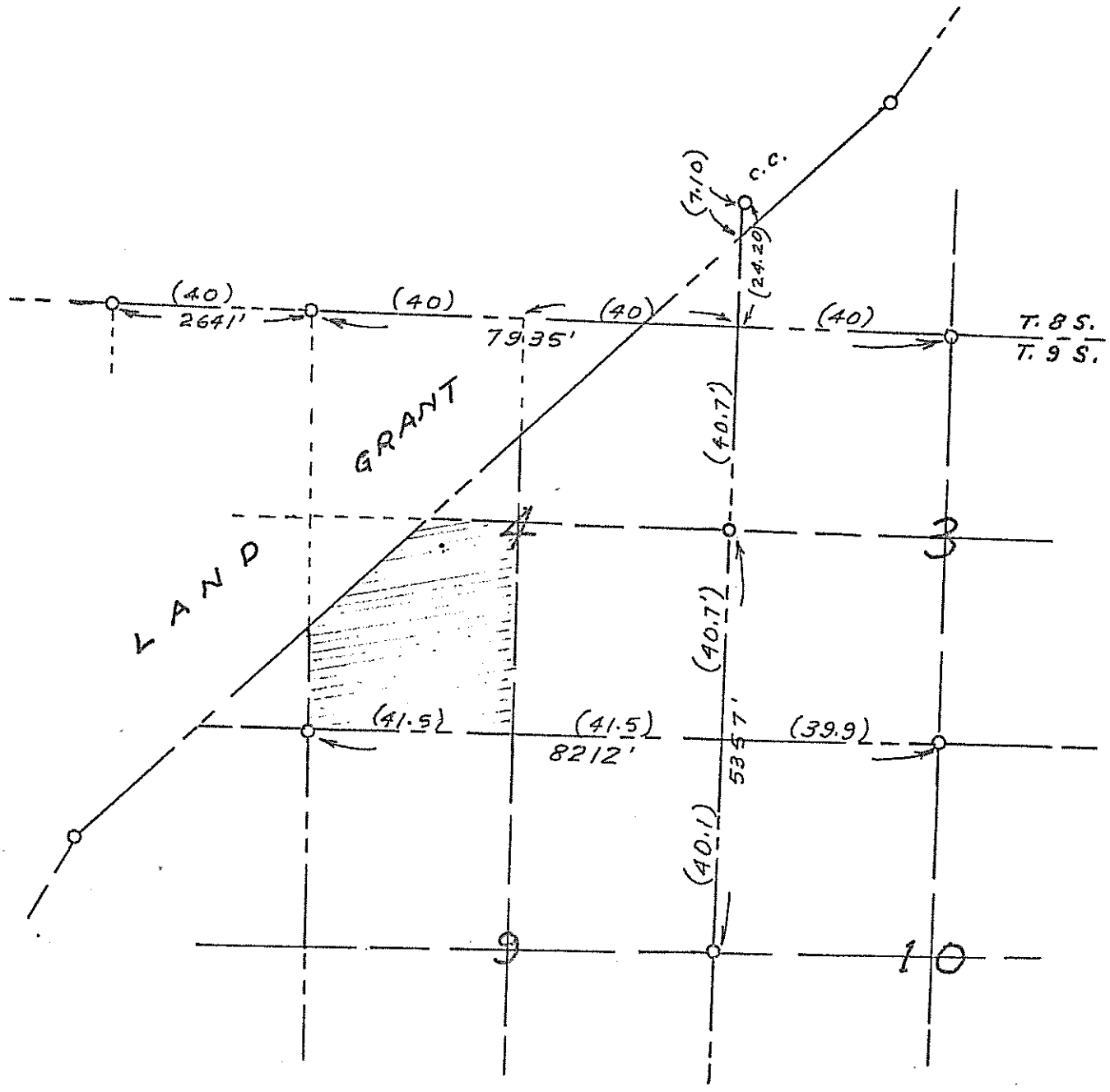
Problem D1 - Wt. 25

In the plat shown below the corners circled indicate original corners found, or acceptable replacements thereof. All other corners are considered lost.

The values shown in parenthesis are original distances in chains. Other values are given in feet.

REQUIRED:

Describe your method for setting all the corners for the fractional SW¼ of Section 4. Identify each point in turn and delineate clearly how you would establish each point. Do not calculate the numerical values.



Problem D2 - Wt. 25

The owner of record of the southwest quarter of Section 16 T31N, R15E, MDM in Ajax County is a Mr. James Smith. Mr. Smith holds a deed recorded January 1, 1940 in Volume 2350, Page 15, Official Records of Ajax County.

Figure 2 on the following page shows the results of a retracement survey of Section 16. The found corners are identified, and assigned coordinates are shown.

Figure 1 below shows the GLO record dimensions of Section 16 and surrounding sections in T31N, R15E, MDM.

REQUIRED:

a Compute the locations of the missing corners to properly subdivide Section 16.

b What are the dimensions of the boundary lines of the Southwest quarter of Section 16?

c Prepare a Record of Survey Map such that it can be filed with the County Recorder of Ajax County. Use a scale of 1 inch = 500 feet, and show a neat pencil drawing of the results of this survey. Show all the information that is normally required on a Record of Survey map.

d How would you inform Mr. Smith regarding the limits of his ownership? At what corners would you set or reset monuments?

(NOTE: If you choose this problem ask the proctor for a large size sheet - 18" x 24" - for the Record of Survey Map.)

T31N R15E MDM

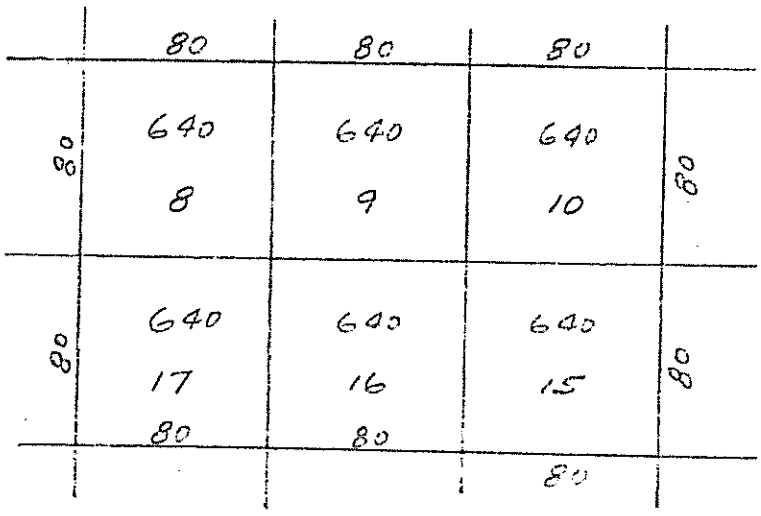
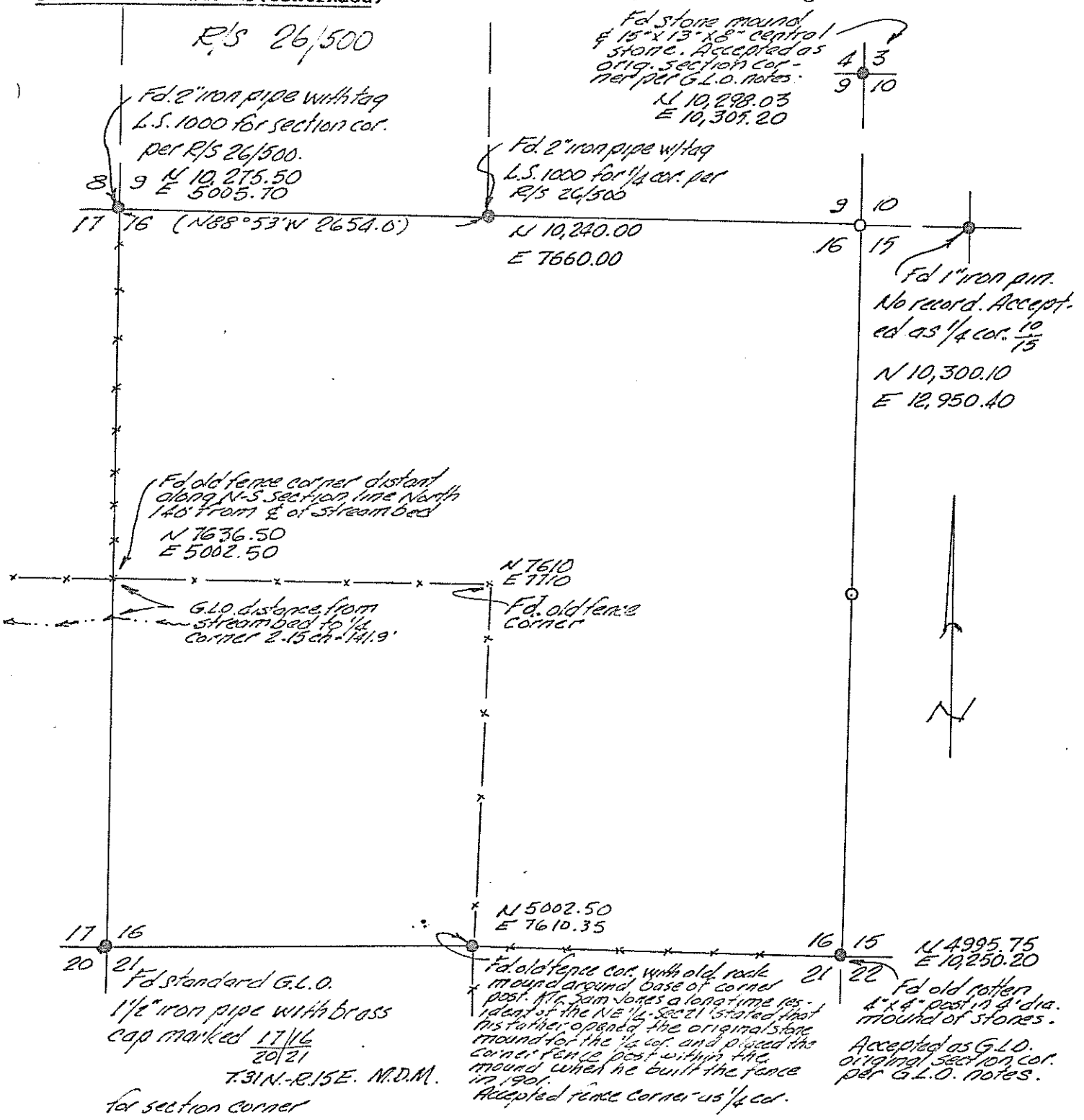


FIGURE 1



Basis of bearings: True as determined by solar observation.

⊤ Monuments found

o Dimensional point - nothing found

( ) Record distance per R/S 26/500.

FIGURE 2

Problem D3 - Wt. 25

The Plat shown on the following page and identified as MB 17/10 represents the information submitted by your field crew. The legal descriptions as obtained from the Recorder's Office are reported below. Research indicates that neither of the two descriptions has been surveyed. Mr. Hampton, your client, wants his property corners established on the ground.

SCHLOSS Rec 9-18-51

All that portion of Lot 14 per MB 17/10 described as follows: Commencing at a point in the center line of Victoria Avenue as shown on said Map which bears North 89°58' East 360 feet from the Southwest corner of said lot; Thence North 12°37'40" West 330.45 feet to the Point of Beginning; Thence South 77°44'50" West 294.04 feet to the westerly line of Lot 14; Thence North 0°01'40" East along the westerly line of said lot (North) 539.50 feet to the Northwest corner of Lot 14; Thence South 80°23'20" East along the northerly line of said lot (S80°25'E) 269.11 feet to the Northwest corner conveyed to Reed W. Thomas, recorded 2270/187 O.R.; Thence South 2°58'40" West along the westerly line of parcel so conveyed 273.04 feet; Thence South 12°37'40" East 163.42 feet to the Point of Beginning.

HAMPTON Rec 10-27-58

All that portion of Lot 14 per MB 17/10 described as follows: Commencing at a point on the west line of said Lot 14, which is North 0°01'40" East from the intersection of the center line of Victoria Avenue with said west line, a distance of 136.13 feet; Thence East with the center line of Victoria Avenue, a distance of 160 feet; Thence North parallel with the west line of said Lot, 159.04 feet to the Southerly line of the land conveyed to Mary Schloss by deed recorded September 18, 1951 in Book 2824 of Official Records, page 4-28; Thence South 77°44'50" West along the South line of said Schloss land, a distance of 163.44 feet more or less, to the West line of said Lot 14; Thence South along said West line to the Point of Beginning.

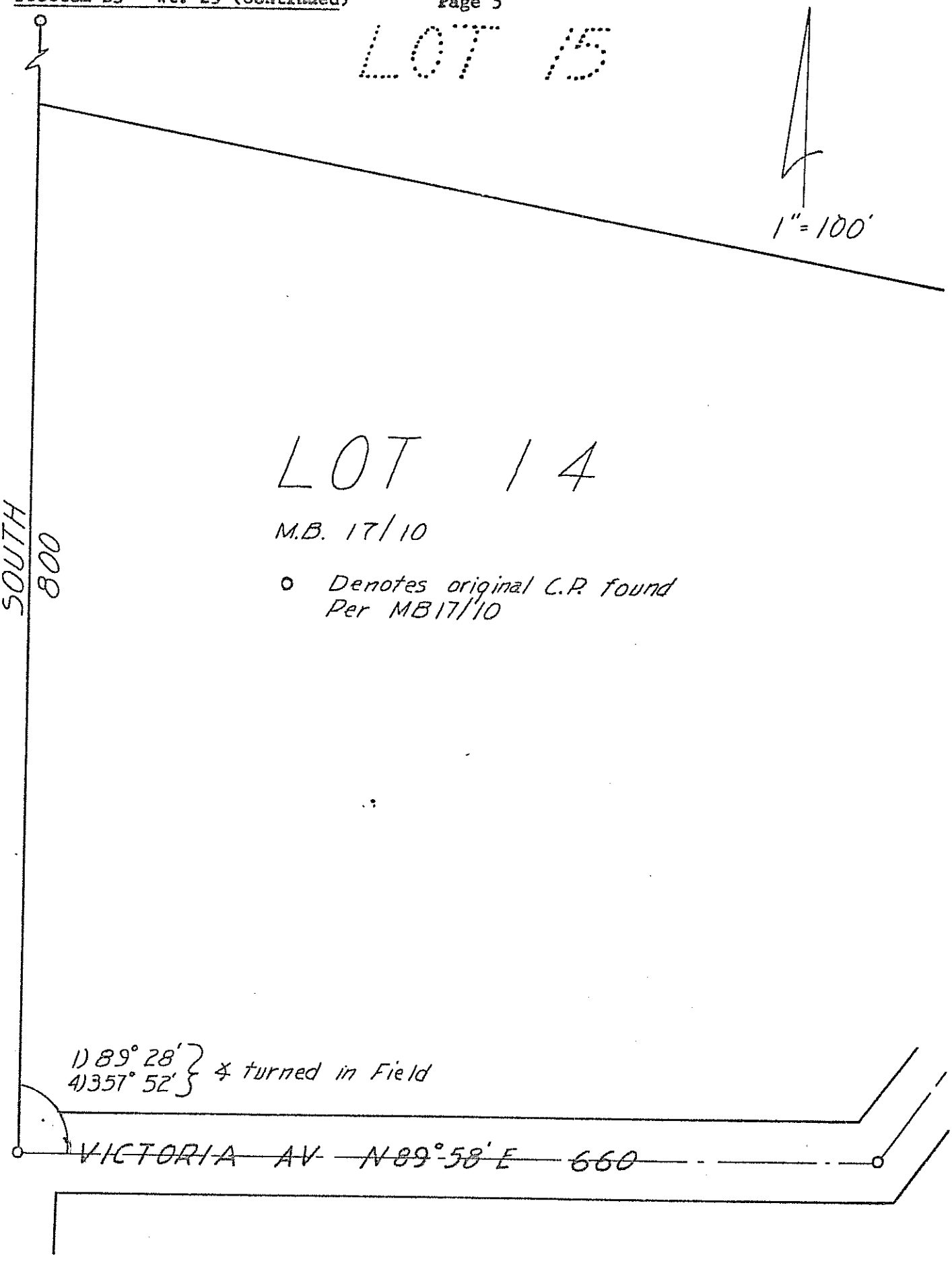
REQUIRED:

a What are the bearings and distances of Hampton's property?

Show your findings on the plat. For this part you may detach from the question book the following page, or you may reproduce it in your workbook.

b Explain briefly what you have done to develop the information necessary to locate Hampton's property corners?

Problem D3 - Wt. 25 (Continued)



Problem D4 - Wt. 12.5

What are the legal obligations and responsibilities of a professional land surveyor with respect to each of the following:

a. arbitration or settlement of boundary disputes between two adjacent owners?

b. incompetent survey work performed by others?

c. incompetent survey work performed by himself?

d. the Land Surveyors' Act?

e. the Subdivision Map Act?

f. filing a Record of Survey map?

g. identification of monuments set by himself?

h. local ordinances existing within the county or city?

Problem D5 - Wt. 12.5

An aircraft flying at 3000 feet above level terrain under ideal flight planning conditions obtains vertical photography of a single strip 54,000 feet in length with a camera by using a 9" x 9" format and a lens with a 6-inch focal length. Overlap in the line of flight is 60%. The photogrammetrist will draw 5-foot contours and is limited to compiling the central 70% of the photography on a Kelsh plotter.

a What is the optimum scale of the manuscript?

b What is the C-factor of the photogrammetric equipment?

c What is the minimum number of photographs necessary for mapping the full length of the strip?

d How many acres would be compiled?

e Assume that the average elevation of the flight strip is at an elevation of 4000 ft. above sea level and that the radius of the earth at that point is 20,906,000 ft. What is the sea level distance between two points that measure 6.25" on a photograph?